

conduct and extend that industry, and no such literature can prove of greater interest to those specially concerned with its modern development, or the large number of men of science outside its particular sphere, than that of explosives.

The names of those discoverers and early workers in connection with fulminate of mercury, guncotton, nitroglycerine, &c., are familiar to all, but few probably realise the risks encountered, the difficulties to be overcome, and the patience and perseverance exhibited in overcoming those difficulties. The thorough and exhaustive manner in which Abel and his colleagues investigated the problems of the manufacture, decomposition, and safe storage of guncotton, leading to the publication of that marvellously complete series of memoirs by Abel in 1866-67, has seldom been equalled, and ten of these are given in sufficiently extensive form in the present volume. In view of the now well-recognised catalytic effect which the products of decomposition of guncotton exercise in promoting further decomposition, the experiments of Abel in submitting stable guncotton to the action of the fumes from an unstable sample are of particular interest, as are also his experiments of the effect of moisture on the keeping qualities, especially when the moist material is exposed to the action of sunlight. One of the most fundamental of Abel's discoveries was that decomposition appeared to be due to foreign matter in the original cellulose, which, on nitro-genising, yielded unstable products.

The work of Nobel, again, in connection with nitroglycerine and its application is another example of perseverance, ingenuity, and inventive genius, but here Mr. MacDonald has been somewhat sparing, for only four pages are devoted to his labours.

Of great interest are the early communications of Pelouze and Schönbein relating to their rival claims as the discoverer of guncotton. Pelouze (1838), in extending Braconnot's work on nitro-starch, which he indicated might be applicable to artillery, also noted that paper, cotton, and linen were nitrated, their new properties being ascribed to xyloïdine (nitro-starch) which covered their surfaces. Schönbein's first nitration (1845) appears to have been on sugar, but soon after the other nitro-substances of like character, including guncotton, were prepared. Schönbein no sooner realised the possible value of the latter than he instituted trials in pistols, carbines, and cannon. Whilst Pelouze therefore nitrated cotton prior to Schönbein, he undoubtedly thought it the same body as from starch and does not appear to have pursued the matter. Schönbein realised their essentially different character, but it remained for

Crum of Glasgow to demonstrate the different composition of the two bodies, and his original paper (1847) is of great interest.

Mr. MacDonald's collection of memoirs covers fully the development of guncotton both in England and on the Continent, and many are the interesting points the reader will find, among them a communication from Berzelius to Schönbein, and the correspondence between the latter and Mr. Hall after the terrible disaster at the Faversham works in July, 1847.

From the few points mentioned it will be seen that Mr. MacDonald's collection of these papers, which first appeared in "Arms and Explosives," is particularly welcome, and one may hope that similar reprints or condensations of papers of great historical interest may, from time to time, become available to the student of to-day, for they would form an excellent course of post-graduate reading.

J. S. S. B.

PROGRESS OF SCIENCE.

Fortschritte der naturwissenschaftlichen Forschung. Herausgegeben von Prof. E. Abderhalden. Dritter Band. Pp. iv+352. Price 16 marks. Vierter Band. Pp. iii+300. Price 15 marks. (Berlin and Vienna: Urban and Schwarzenberg, 1911 and 1912.)

THESE further volumes of a valuable work are quite up to the level of the preceding ones. There is, however, a considerable reduction in the number of the separate essays, and while this enables the writers to deal with their subjects at greater length, it somewhat narrows the range. In vol. iii., A. Wegener deals with recent investigations in atmospheric physics, including the stratification of the atmosphere, the isothermal layer, the formation of air-billows, the structure of hail and thunder clouds, and Birkeland and Störmer's electronic theory of the aurora. The article is lavishly illustrated by photographs and diagrams. W. Johansen, of Copenhagen, deals with heredity on the principle of the genotype, *i.e.* the aggregate of inherited tendencies embodied in the germ. His main thesis is to show that genotypes differ discontinuously, and thus recall the discontinuities between chemical species. Dr. Gustav Eichhorn, of Zürich, has an essay on the present position of wireless telegraphy and telephony. The system chiefly dealt with is the Telefunken system. As regards telephony, we find an interesting account of the comparative merits of Duddell, Poulsen, and Goldschmidt's recently invented high-frequency generator.

There is a lengthy article on directive forces in plant geography by M. Rikli, of Zürich. He goes

fully into the effects of heat, moisture, light, wind, soil, micro-organisms, range, and idiosyncrasy. Although the author describes plant geography as a young science, the great catalogue of references to literature appended to his article gives one quite a different impression. Prof. H. Klaatsch, Breslau, gives the first of a series of articles on the genesis and acquisition of human characteristics, dealing in the first instance with the development of the human hand. He answers the question as to why the ape did not evolve into a man by saying: Because he lost his thumb.

In vol. iv. we find Prof. London, of St. Petersburg, discoursing on the development of operative method in the study of digestion and resorption. The treatment is of great practical interest, but the article is illustrated in a manner provocative of fierce attacks from anti-vivisectionist quarters. Dr. H. Zickendraht, Bâle, treats of experimental aerodynamics, with interesting sidelights on voluntary and automatic stabilisation. F. Zschokke, Bâle, deals with the zoobiological significance of the Ice Age, pointing out how the fauna characteristic of low temperatures must have been gradually restricted as the ice receded from Europe, and that the isolated survivors in special districts cannot have got into their refuges by recent migration, having been caught in a mesh of higher temperatures and high-temperature organisms. K. Heilbronner's article on aphasia exhibits at once the theoretical limitations and the great practical attainments of specialists dealing with aphasia, alexia, agraphia, and apraxia. He denies that a special area of the brain can be called the "speech area."

Dr. W. Pauli's essay on the colloid changes of state of albuminous bodies is a summary of recent work on substances of steadily increasing importance. The volume is concluded by an admirable and timely contribution by Dr. G. Eichhorn on automatic telephony, in which it is explained how, by a suitable subdivision and decentralisation of exchanges, it is possible to set up an automatic system for some 100,000 subscribers, which offers advantages both in trustworthiness and economy of time.

OUR BOOKSHELF.

Spices. By Henry N. Ridley, C.M.G., F.R.S. Pp. ix+449. (London: Macmillan and Co., Ltd., 1912.) Price 8s. 6d. net.

It is difficult to realise now the important position which spices occupied in the Middle Ages, when the great commercial cities of central Europe owed no small part of their wealth to commerce in these products, and the desire to share in this lucrative trade led the Portuguese to seek a sea-route to India. In this volume Mr. Ridley does not neg-

lect this peculiarly interesting part of his subject, but gives, in each of the series of monographs of which his book is composed, a short account of the commercial history of the spice dealt with.

In the technical portion of each monograph the mode of treatment adopted is to give a description of the plant and of its varieties in cultivation, followed by an account of the soil and climate suited to it, the modes of cultivation, the pests and diseases which attack it, and the methods of preparing the spice for export. Lastly, an account is given of the industry as carried on in the chief producing countries, with notes on the uses of the spice locally and in Europe. The statistics of trade given are in most cases not very recent. It may also be suggested that it would have been worth while to state that clove-leaves yield a valuable essential oil, which has been exported in small quantity from Seychelles.

The chemistry of spices has been adequately dealt with elsewhere, and Mr. Ridley properly refers very briefly to the nature of the volatile oils and other constituents to which spices owe their aromatic or pungent properties. These notes on the chemistry of the spices are, however, occasionally so compressed as to be somewhat misleading to the inexpert.

A book of this kind must appeal mainly to planters in the tropics, and Mr. Ridley's extensive experience of the needs of this class of readers has enabled him to produce a volume which is a valuable addition to the rather scanty literature of tropical agriculture.

T. A. H.

Catalogue of the Noctuidæ in the Collection of the British Museum. By Sir George F. Hampson, Bart. Pp. xvii+689. (Catalogue of the Lepidoptera Phalænæ in the British Museum. Volume xi.) Accompanied by a volume of plates (clxxiv-cxci). (London: Printed by order of the Trustees. Sold by Longmans and Co., B. Quaritch, Dulau and Co., Ltd., and at the British Museum (Natural History), 1912.) Price: text, 20s.; plates, 17s. 6d.

In the fourth volume of the present work the Noctuidæ were commenced, and fifteen subfamilies were defined. Four of these have now been monographed, and vol. xi., which has just appeared, includes four more: the Euteliæ, with 12 genera and 175 species; the Stictopterinae, with 10 genera and 112 species; the Sarrothripinae, with 58 genera and 330 species; and the Acontianæ, with 70 genera and 324 species. In the series of species of Noctuidæ, the numbers in vol. xi. extend from 6198 to 7127. "The four subfamilies are modifications of the great Quadrid section of the Noctuidæ, and are almost confined to the tropical and warmer temperate regions, few genera and species extending to the colder zones, and none to the arctic and alpine zones."

We have no special remarks to make on the present volume, except that it appears to be fully up to the standard of former ones. In addition to the plates, there are 275 figures in the text, and at the end of the volume we find some "addenda and corrigenda."